



Contribution ID: 127

Type: **Contributed Oral Presentation**

## Constraints on neutron skin thickness and symmetry energy

*Tuesday, 27 May 2025 08:55 (15 minutes)*

The structure of exotic neutron-rich nuclei is one of the main science drivers in contemporary nuclear physics research [1]. The new measurements of pygmy dipole (PDR) and giant dipole (GDR) resonances in neutron-rich nuclei have sparked advancements in nuclear models. The quasiparticle random phase approximation, utilizing the self-consistent mean-field derived from Skyrme effective interactions, is a widely used tool for describing the PDR and GDR. This approach made it possible to a successful description of the properties of low-lying states and the characteristics of giant multipole resonances in spherical nuclei [2,3].

Due to the anharmonicity of vibrations there is a coupling between simple particle-hole configurations and more complex states [4,5]. As an illustration, we study the properties of the low-lying dipole states in the neutron-rich Ca and Ni isotopes [6,7]. This reveals a number of characteristic features of the low-energy E1 modes. The effect of the low-energy E1 strength on the electric dipole polarizability is discussed [5]. The correlations between the electric dipole polarizability, the symmetry energy, and neutron skin thickness are studied [8].

The research was supported within the framework of the scientific program of the National Center for Physics and Mathematics, topic no. 6 “Nuclear and Radiation Physics”(stage 2023-2025).

- [1] A. Zilges, D.L. Balabanski, J. Isaak, and N. Pietralla, Prog. Part. Nucl. Phys. 122, 103903 (2022).
- [2] N. Paar, D. Vretenar, E. Khan, and G. Colò, Rep. Progr. Phys. 70, 691 (2007).
- [3] E.G. Lanza, L. Pellegri, A. Vitturi, and M.V. Andrés, Prog. Part. Nucl. Phys. 129, 104006 (2023).
- [4] V.G. Soloviev, Theory of Atomic Nuclei: Quasiparticles and Phonons. Bristol/Philadelphia 1992.
- [5] A.P. Severyukhin, N.N. Arsenyev, and N. Pietralla, Phys. Rev. C. 104, 024310 (2021).
- [6] N.N. Arsenyev, A.P. Severyukhin, V.V. Voronov, and N.V. Giai, Phys. Rev. C. 95, 054312 (2017).
- [7] N.N. Arsenyev, A.P. Severyukhin, V.V. Voronov, and N.V. Giai, Phys. Part. Nucl. 50, 528 (2019).
- [8] N.N. Arsenyev, and A.P. Severyukhin, Moscow Univ. Phys. Bull. 79, 200 (2024).

**Primary author:** Dr ARSENYEV, Nikolay (Joint Institute for Nuclear Research, Dubn  Russian Federation)

**Co-author:** Dr SEVERYUKHIN, Alexey (Joint Institute for Nuclear Research, Dubn  Russian Federation)

**Presenter:** Dr ARSENYEV, Nikolay (Joint Institute for Nuclear Research, Dubn  Russian Federation)

**Session Classification:** Parallel Session

**Track Classification:** Nuclear Structure